ENERGY STORAGE GLOSSARY OF TERMS

Term	Definition	Examples
– A –		
Alternating Current (AC)	Alternating current (AC) is an electric current which periodically reverses direction, in contrast to direct current (DC) which flows in only one direction.	
Area Control Error (ACE)	Area control error is the difference between scheduled and actual electrical generation within a control area on the power grid.	
Automatic Generation Control (AGC)	Automatic generation control is a system for adjusting the power output of multiple generators at different power plants in response to changes in the load.	
Automated Metering Infrastructure (AMI)	Automated metering infrastructure describes an integrated system of smart meters, communications networks, and data management systems that enable two-way communication between utilities and customers.	
APU	Ancillary Power Unit	
– B –		
Battery Energy Storage System (BESS)	A battery energy storage system is a rechargeable battery system that stores energy to be used at a later time.	
Benefit Stream Affected	The benefit stream(s) affected by this policy.	Frequency Regulation
Black Start	A black start is the process of restoring a power station to operation without relying on the external electric power transmission network.	An energy storage system is used to re-start turbines of a generation facility after a large blackout causes generators to go offline.
– C –		
Capital Expenditure (CAPEX)	The total up-front capital expense of the system stated in dollars.	2000000
CCGT	Combined-cycle gas turbine	
Compressed Air Energy Storage (CAES)	Compressed Air Energy Storage is a way to store energy using compressed air. Surplus power is used to compress air using a rotary compressor and then stores the energy in a chamber. When the power is needed, it is released from the chamber and passed through an air turbine that	

Term	Definition	Examples
	generates electricity from the flow of high pressure air.	
Contracted	A project that is Contracted is under signed contract to be built, however construction has not yet begun.	
– D –		
Debt Provider	The primary debt provider in the project.	
Developer	The person or organization responsible for organizing the development and implementation of the energy storage project.	
Demand Response (DR)	Demand response is a change in the power consumption of an electric utility customer to better match the demand for power with the supply.	
Depth of Discharge (DOD)	Depth of discharge is an alternative method to indicate a battery's state of charge; it is the complement to the battery's state of charge. Depth of discharge is usually expressed using units of A h (e.g, 0 is full and 50 A h is empty) or percentage points (100 % is empty and 0 % is full).	
Direct Current (DC)	Direct current (DC) is an electric current which flows in one direction only, in contrast to alternating current (AC).	
Duration at Rated Power	The amount of time (in HH:MM) the storage system can output at its rated power capacity.	02:30
– E –		
Energy Information Administration (EIA)	The U.S. Energy Information Administration (EIA) is a principal agency of the U.S. Federal Statistical System responsible for collecting, analyzing, and disseminating energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment.	
Electric Bill Management	Energy storage used by end-use customers in a variety of facets to reduce electric bills.	Can be used to eliminate demand charges, charge during off-peak to reduce peak consumption, etc.
Electric Bill Management w/ Renewables	Energy storage used by end-use customers in a number of facets, and in conjunction with renewable generation resources, to reduce electric bills.	Smooth the output of solar panels to eliminate the risk of high

Term	Definition	Examples
		demand charges during peak hours when the solar drops off.
Electric Energy Time Shift	Energy time shift involves storing energy during low price times, and discharging during high price times.	
Electric Supply Capacity	Depending on the circumstances in a given electric supply system, energy storage could be used to defer and/or to reduce the need to buy new central station generation capacity and/or to 'rent' generation capacity in the wholesale electricity marketplace.	
Electric Supply Reserve Capacity - Non-Spinning	Generation capacity that may be offline, or that comprises a block of curtailable and/or interruptible loads, and that can be available within 10 minutes. Unlike spinning reserve capacity, non-spinning reserve capacity is not synchronized with the grid (frequency). Non-spinning reserves are used after all spinning reserves are online.	
Electric Supply Reserve Capacity - Spinning	Generation capacity that is online but unloaded and that can respond within 10 minutes to compensate for generation or transmission outages. 'Frequency-responsive' spinning reserve responds within 10 seconds to maintain system frequency. Spinning reserves are the first type used when a shortfall occurs.	
EPC	Stands for "Engineering, Procurement, Construction" - Identifies the entity or entities that performed any or all of these services for the project.	DBR Construction
Electromagnetic Compatibility (EMC)	Electromagnetic compatibility (EMC) is the ability of electrical equipment and systems to function acceptably in their electromagnetic environment, by limiting the unintentional generation, propagation and reception of electromagnetic energy which may cause unwanted effects such as electromagnetic interference (EMI) or even physical damage in operational equipment.	
EOC	Executive Oversight Committee	
ESHB	Energy Storage Handbook	
ESTF	Energy Storage Test Facility	
EV	Electric Vehicle	
– F –		
Frequency Regulation	Frequency regulation involves moment-to-moment reconciliation of the supply of electricity and the demand for electricity. The reconciliation is done every few	

Term	Definition	Examples
	seconds. So at any given moment, if electricity demand exceeds supply then the supply is increased to meet demand. And, if demand is less than supply then the supply is decreased.	
– G –		
G & T	generation and transmission	
Grid Interconnection	The level at which an energy resource (such as generation or storage) connects to the grid. An energy resource could be connected at Transmission, Primary Distribution, or Secondary Distribution levels.	Transmission; Secondary Distribution
GST	Grid Storage Technologies	
GW	gigawatts	
– H–		
hr	hour	
Hz	hertz	
– I –		
Installed Cost ($/kW)	The installed cost includes all equipment, delivery, installation, interconnection, and step- up transformation costs. For this benchmarking work it was assumed a site was available; however no land costs, permitting, and project planning costs were included. These costs are comparable to the installed costs of a combustion turbine (CT) or combined-cycle gas turbine (CCGT) for up-front capital and financing requirements.	
Investor Owned Utility (IOU)	An investor owned utility is a business organization providing and managing a utility as a private enterprise rather than a function of a government or utility cooperative.	
Independent Power Producer (IPP)	An independent power producer (IPP) or non-utility generator (NUG) is an entity, which is not a public utility, but which owns facilities to generate electric power for sale to utilities and end users.	
ISO/RTO (Independent System Operator/Regional Transmission Organization)	The ISO or RTO that manages the grid where the energy storage system is installed, if applicable. In the areas where an ISO is established, it coordinates, controls, and monitors the operation of the electrical power system, usually within a single US State, but sometimes encompassing multiple states. RTOs typically perform the same functions as ISOs, but cover a larger geographic area.	CAISO; NYISO
– J –		
No "J" Terms		

Term	Definition	Examples
– K –		
kW	A kilowatt is a unit of power, expressed as one thousand watts.	
kWh	A kilowatt hour is a unit of energy, expressed as one thousand watts being used for an hour.	
– L –		
Lead Acid / Pb-acid Battery	Lead-acid is one of the oldest and most developed battery technologies. They remain popular because they can produce high or low currents over a wide range of temperatures, they have a good shelf life and life cycles, and they are relatively inexpensive to manufacture and purchase.	
Levelized Cost of Capacity (LCOC) ($/kW-yr.)	The levelized cost of capacity is the $/kW-yr. revenue per kW of discharge capacity needed to cover all life-cycle fixed and variable costs and provide the target rate of return based on financing assumptions and ownership types. This metric is primarily of interest for comparing to capacity resources, such as a CT.	
Levelized Cost of Energy (LCOE) ($/MWh)	The LCOE is the $/MWh revenue for delivered energy needed to cover all Life- cycle fixed and variable costs,and provide the target rate of return based on financing assumptions and ownership types. This metric is primarily of interest for energy resources such as renewables or baseload fossil generation.	
Lithium (Li) Battery	Lithium batteries are primary batteries that have metallic lithium as an anode. These types of batteries are also referred to as lithium-metal batteries. They stand apart from other batteries in their high charge density (long life) and high cost per unit.	
Load Management System (LMS)	A load management system is a system which balances the supply of electricity on a network with the electrical load by adjusting or controlling the load as opposed to the output. Load management allows utilities to reduce demand for electricity during peak usage times, which can in turn reduce costs by eliminating the need for peaking power plants.	
Load Following	Load following resources' output changes in response to the changing balance between electric supply (primarily generation) and end user demand (load) within a specific region or area, over timeframes ranging from minutes to a few hours.	
Load-serving Entity (LSE)	A load-serving entity is an industry term for a utility / electric company. Load-serving entities provide electric service to end-users and wholesale customers.	
– M –		

Term	Definition	Examples
MMBtu	one million Btu (british thermal units)	
Mega Volt-ampere reactive (MVAR)	A mega volt-ampere reactive (var) is a unit of measurement of reactive power. Reactive power exists in an AC circuit when the current and voltage are not in phase.	
Megawatt (MW)	A megawatt is a unit of power, expressed as one million watts.	
Megawatt (MWh)	A megawatt hour is a unit of energy, expressed as one million watts being used for an hour.	
– N –		
Sodium-Sulfur (NaS)	A sodium–sulfur battery is a type of molten-salt battery constructed from liquid sodium (Na) and sulfur (S). This type of battery has a high energy density, high efficiency of charge/discharge and long cycle life, and is fabricated from inexpensive materials. The operating temperatures of 300 to 350 °C and the highly corrosive nature of the sodium polysulfides, primarily make them suitable for stationary energy storage applications. The cell becomes more economical with increasing size.	
National Electrical Code (NEC)	The National Electrical Code (NEC), or NFPA 70, is a regionally adoptable standard for the safe installation of electrical wiring and equipment in the United States.	
Nickel-cadmium (NiCd)	The nickel–cadmium battery (NiCd battery or NiCad battery) is a type of rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes.	
National Institute of Standards and Technology (NIST)	The National Institute of Standards and Technology (NIST) is a physical sciences laboratory, and a non-regulatory agency of the United States Department of Commerce. Its mission is to promote innovation and industrial competitiveness. NIST's activities are organized	
– O –		
O&M	Operations and Maintenance	
OEM	original equipment manufacturer	
– P –		
Performance	Any performance statistics or results available on the project.	The system performed at a capacity factor of 90% during the year of 2010. Other examples of performance statistics include: -

Term	Definition	Examples
		Round Trip Efficiency (RTE) - Ramping Rate - Greenhouse Gas Emissions - Noise (decibels) - Availability - Number of maintenance visits
Power conversion system / Power conditioning system (PCS)	A power converter is an electrical or electro-mechanical device for converting electrical energy. It may be converting AC to or from DC, or the voltage or frequency, or some combination of these.	
Plug-in Electric Vehicle (PEV)	A plug-in electric vehicle (PEV) is any vehicle that can be recharged from an external source of electricity, such as wall sockets, and the electricity stored in the rechargeable battery packs drives or contributes to drive the wheels.	
Plug-in Hybrid Electric Vehicle (PHEV)	A plug-in electric hybrid vehicle is any vehicle that can be recharged from an external source of electricity, while also supporting traditional sources of fuel such as gasoline or diesel.	
Pumped Hydroelectric Energy Storage (PHES)	Pumped-storage hydroelectricity (PSH), or pumped hydroelectric energy storage (PHES), is a type of hydroelectric energy storage used by electric power systems for load balancing. The method stores energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation.	
PSLF	Positive Sequence Load Flow	
Present Value of Life-cycle Costs ($/kW Installed)	The Present Value of Life-cycle Costs includes the installed costs (above) and all ongoing fixed and variable operating costs over useful life. The present value of the annual costs is divided by the kW of energy storage system discharge capacity installed.	
Present Value of Life-cycle Costs ($/kWh Installed)	The Present Value of Life-cycle Costs described above divided by usable kWh of energy storage capacity installed. Both of the Present Value of Life-cycle Costs metrics can be compared against estimates of present value benefits or revenues to estimate cost-effectiveness.	
Public Utility Commission (PUC)	In the United States, a utilities commission, utility regulatory commission (URC), public utilities commission (PUC), or public service commission (PSC)	

Term	Definition	Examples
	is a governing body that regulates the rates and services of a public utility, such as an electric utility.	
PV	Photovoltaic or present value	
– Q –		
No "Q" terms		
– R –		
Ramping	Changing the loading level of a Generating Unit in a constant manner over a fixed time (e.g., Ramping up or Ramping down). Such changes may be directed by a computer or manual control.	
Rated Power	The total possible output from the energy storage system, expressed in kW.	600kW
Redox Flow Battery (RFB)	A flow battery, or redox flow battery (after reduction–oxidation), is a type of electrochemical cell where chemical energy is provided by two chemical components dissolved in liquids contained within the system and separated by a membrane.	
Regional Transmission Organization (RTO)	A regional transmission organization in the United States is an electric powertransmission system operator (TSO) that coordinates, controls, and monitors a multi-state electric grid. The transfer of electricity between states is considered interstate commerce, and electric grids spanning multiple states are therefore regulated by the Federal Energy Regulatory Commission (FERC).	
Renewable Energy Time-shift	Centralized or distributed Electric Energy Time Shifting specifically related to the uncontrollable nature of renewable generation.	Using an energy storage system to capture excess energy generated by grid-connected wind and solar farms during low demand times in order to dispatch it during high demand times.
Renewables Capacity Firming	Use of storage to mitigate rapid output changes from renewable generation due to: a) wind speed variability affecting wind generation and b) shading of solar generation due to clouds. It is important because these rapid output changes must be offset by other "dispatchable" generation.	

Term	Definition	Examples
– S –		
Service/Use Case	The benefits provided by the energy storage system. Services reference individual benefits and may come from direct market participation or reduced/deferred cost relative to the status quo. Use Cases are groups of (or sometimes individual) services that are provided by a single energy storage system. If possible, select from our pre-determined set values.	Electric Energy Time-Shift; Renewables Capacity Firming; Frequency Regulation
Supervisory Control and Data Acquisition (SCADA)	Supervisory Control and Data Acquisition is a control system architecture comprising computers networked data communications and graphical user interfaces (GUI) for high-level process supervisory management. It allows industrial organizations to control industrial processes locally or at remote locations, and to monitor, gather, and process real time industrial data.	
State of charge (SOC)	State of charge is the level of charge of an electric battery relative to its capacity. The units of SoC are percentage points (0% = empty; 100% = full). The units of SoC are percentage points (0% = empty; 100% = full).	
Static Synchronous Compensator (STATCOM)	A static synchronous compensator (STATCOM), also known as a static synchronous condenser (STATCON), is a regulating device used on alternating current electricity transmission networks. It is based on a power electronics voltage-source converter and can act as either a source or sink of reactive AC power to an electricity network.	
Static VAR Compensator (SVC)	A static VAR compensator is a set of electrical devices for providing fast-acting reactive power on high-voltage electricity transmission networks. SVCs are part of the Flexible AC transmission system device family, regulating voltage, power factor, harmonics and stabilizing the system.	
– T –		
T&D	transmission and distribution	
Thermal Energy Storage (TES)	Thermal Energy Storage allows excess thermal energy to be stored and used later. Storage media include water or ice-slush tanks, masses of native earth or bedrock accessed with heat exchangers by means of boreholes, deep aquifers contained between impermeable strata; shallow, lined pits filled with gravel and water and insulated at the top, as well as eutectic solutions and phase-change materials.	
TOU	time of use	
Transmission Congestion Relief	In many areas, transmission systems are becoming congested during periods of peak demand, driving the	

Term	Definition	Examples
	need and cost for more transmission capacity and increased transmission access charges. Additionally, transmission congestion may lead to increased use of congestion charges or locational marginal pricing (LMP) for electric energy. Storage can be used to avoid congestion-related costs and charges. In this application, storage systems are installed at locations that are electrically downstream from the congested portion of the transmission system. Energy is stored when there is no transmission congestion, and discharged (during peak demand periods) to reduce transmission capacity requirements.	
Transmission Support	Energy storage used for transmission support improves T&D system performance by compensating for electrical anomalies and disturbances such as voltage sag, unstable voltage, and sub-synchronous resonance. The result is a more stable system with improved performance (throughput). Benefits from transmission support are highly situation-specific and site-specific.	
Transmission System Operator (TSO)	A Transmission System Operator (TSO) is an entity entrusted with transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure.	
Transportable Transmission and Distribution (T&D) Upgrade Deferral	The T&D Upgrade Deferral benefit is related to the use of a relatively small amount of modular storage to: a) defer the need to replace or to upgrade existing T&D equipment or b) to increase the equipment's existing service life (life extension). Storage for T&D equipment life extension is especially compelling for the aging fleet of underground circuits which are quite expensive to replace or to upgrade. Those circuits' life can be extended by: a) reducing the number of ground faults and/or b) reducing loading such that operating temperature is reduced, which reduces degradation of the insulation. Transportable systems can be moved to where they are needed most on the grid.	
– U –		
Uninterruptible Power Supply (UPS)	An uninterruptible power supply or uninterruptible power source (UPS) is an electrical apparatus that provides emergency power to a load when the input power source or mains power fails. A UPS differs from an auxiliary or emergency power system or standby generator in that it will provide near-instantaneous protection from input power interruptions, by supplying energy stored in batteries, supercapacitors, or flywheels.	
– V–		

Term	Definition	Examples
VAR	reactive power and volt-ampere reactive	
Vented lead acid (VLA)	Vented lead acid batteries are commonly called “flooded” or “wet cell” batteries because this type of battery “vents” hydrogen continuously during normal float operation.	
Valve-regulated Lead-acid (VRLA) Battery	A valve-regulated lead-acid battery (VRLA battery) sometimes called sealed lead-acid (SLA) or maintenance free battery, is a type of lead–acid battery. They are widely used in large portable electrical devices, off-grid power systems and similar roles, where large amounts of storage are needed at a lower cost than other low-maintenance technologies like lithium-ion.	
Volts (V)	A volt is a unit of electromotive force, the difference of potential that would drive one ampere of current against one ohm resistance.	
Voltage Support	To manage "reactance" at the grid system level, grid system operators rely on an ancillary service called ‘voltage support’. The purpose of voltage support is to offset reactive effects so that grid system voltage can be restored or maintained. "Reactance" occurs because equipment that generates, transmits, or uses electricity often has or exhibits characteristics like those of inductors and capacitors in an electric circuit.	
– W –		
No “W” terms		
– X –		
No “X” terms		
– Y –		
No “Y” terms		
– Z –		
Zinc-Bromine (ZnBr2) Flow Battery	The zinc–bromine flow battery is a type of hybrid flow battery. A solution of zinc bromide is stored in two tanks. When the battery is charged or discharged the solutions (electrolytes) are pumped through a reactor stack and back into the tanks.	